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PRECAUTIONS IN INDUSTRIAL USES OF Radioactive Isotopes

ISOTOPES for scientific, agricultural, medical and industrial use constitute the first great contributions of the development of atomic energy to peacetime purposes. At the present time isotopes produced in Canada's Atomic Energy Project are at work in a number of university laboratories where they are increasing our store of scientific knowledge, while their practical applications are already widespread, and will continue to grow in number and importance.

Isotope is a word derived from two Greek words "iso" and "topos", meaning *same* and *place*, and this very correctly gives its technical connotation. An isotope is defined as one of two or more species of an element, occupying the same position in the periodic table of the elements, identical in chemical behavior and distinguishable only by radioactive transformations or small differences in atomic weights. For example, there are five isotopes of carbon with atomic weights 10, 11, 12, 13 and 14. Two, those with atomic weights of 12 and 13, are found in nature and are known as "stable" isotopes and the other three are man-made and "radioactive". For every 100 carbon atoms found in nature, 99 will be the ordinary type with atomic weight 12, known as C^{12}, and one will be the rare variety with atomic weight 13, called C^{13}. This is true whether the carbon is found in sugar, in coal, or in the graphite in a pencil. Radioactive isotopes or simply radioisotopes possess the property of giving off rays continuously and man has no way of stopping this process. Every radioactive substance has a so-called half-life which is the length of time needed for one-half of its radioactive energy to decay. The half-life of radioisotopes may vary from a few seconds to hundreds of years. For example, C^{11} has a half-life of 21 minutes, C^{14} a half-life of 6400 years and C^{10} of 22 seconds.

Atoms of radioisotopes emit three possible distinct kinds of radiations. These types are: the *alpha rays*, now known to be helium nuclei, *beta rays* which are ordinary electrons or sometimes positrons (same as electrons in mass and amount of electric charge but the charge is positive instead of negative), and *gamma rays*, which are short x-rays or electromagnetic waves. Each of these types of radiations will darken a photographic plate, produce scintillations in crystals of zinc blende, calcium tungstate, naphthalene and other fluorescent substances. They will also ionize a gas, that is, make it a conductor of electricity. Each type of radiation produces these effects to different extents and even the same radiation, such as the beta rays, from different radioactive elements have different ionizing or photographic effects. The three rays are absorbed to different extents by matter. Thus, alpha rays are readily absorbed by a sheet of paper, beta rays by a sheet of aluminum, but gamma rays will pass through such sheets. However, very large masses of matter do stop gamma rays, hence dense materials like lead in the form of thick sheets or bricks, are used to protect (shield) people and certain kinds of apparatus from gamma rays.

As already mentioned, radioactive substances give off radiations with different energies and it is interesting to know how the energies (and consequently the penetrating power) of these radiations are expressed. It is the custom to express the energy of a quantum or particle of any radiation in equivalent energy which a single free electron would acquire if it passed from one plate to another, when these plates are at a difference of potential of so many (million) volts. The

energy is then expressed in million electron volts, written as MeV. Half-life, symbol, mass number and energy of a few useful isotopes are given in Table I (see page 3).

Experience has shown that the handling of radioactive isotopes may involve a hazard to health unless adequate precautions are taken. Furthermore, buildings can become highly contaminated if radioactive substances are handled carelessly, and the cost of decontamination is very great. It is the purpose of this paper to indicate some uses of radioactive isotopes in industry, the nature of the hazards and the type of precautions which must be taken when using them.

SOME USES OF RADIOACTIVE ISOTOPES IN INDUSTRY

The radioactive species of isotopes occur in only limited number in nature and are found almost entirely in the elements heavier than lead, familiar examples being radium, thorium and uranium. However, even before the war, nuclear physicists were able to produce radioactive isotopes of nearly all the elements by bombarding normally stable elements with subatomic particles in "atom-smashing" devices such as the cyclotron. The radioisotopes produced in this way were extremely small in quantity and were too expensive for use in industry.

Wartime development of the chain-reacting pile or reactor revolutionized the production of radioisotopes. Production of most of the isotopes has been increased to thousands of times that possible with the cyclotron. The fact that radioisotopes of most of the elements can now be produced in the pile makes possible a wide variety of uses in such fields as medical bacteriology, physics, chemistry, industrial research and control, and metallurgy. Furthermore, the expense of production is no longer a serious barrier to the prospective user. A good illustration of this point is the case of C^{14}, a radioisotope with almost unlimited usefulness in organic chemistry and biology. It has been calculated that one millicurie of C^{14} produced in a cyclotron would cost $1,000,000.00, whereas the same amount of this isotope produced in the pile at Chalk River is now available at a cost of only $36.00.

The great usefulness of radioactive isotopes depends upon two important facts:—

1. The radioactive isotope will exhibit the same chemical behavior as the stable species or stable isotopes of the element.
2. The radioactive isotopes emit radiations which will determine their identity and location.

Due to these two properties radioisotopes can be used as *tracer* atoms which will follow along exactly with the usual species of atoms, but which will indicate their location even in the most complicated systems and processes. As tracers, radioisotopes constitute the most useful new research tool since the invention of the microscope in the 17th century. In fact, they give us the rarest of all scientific advances, a new mode of perception. Thus a minute quantity of some of these radioactive isotopes can be followed through a complicated chemical reaction, through the metabolism of the body, through an entire biological cycle or through any other physical or chemical process and still be definitely identified. Dilution or chemical changes of the tracer isotope will make no difference as the radioactivity will still trigger a Geiger counter, ionize gases or darken photographic film. The atoms are thus tagged or labelled for as long as the radioactivity lasts.

Due to the excellent work of certain physicists, extremely sensitive electronic instruments are now available for the detection of the various radiations emitted by radioisotopes. These electronic instruments

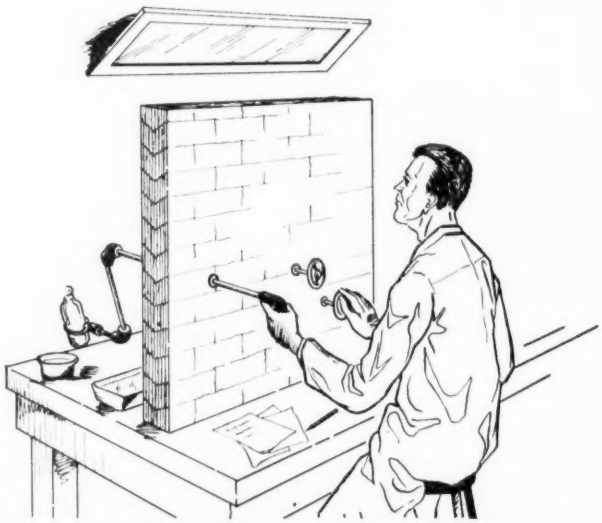


TABLE I.

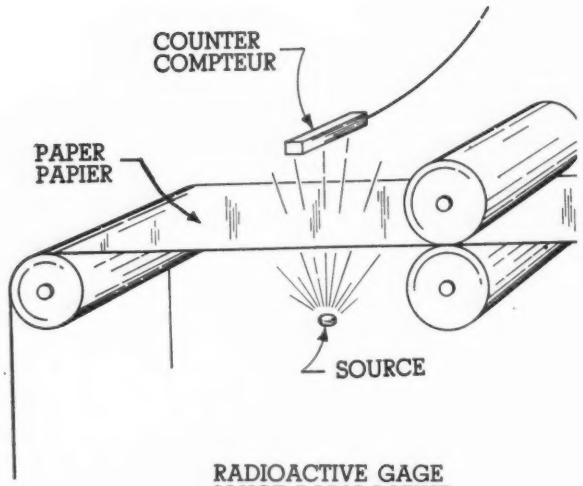
A table of some useful isotopes

Element	Symbol	Mass No. of Isotope	Half-Life	Energy (MeV)	
				Beta	Gamma
Carbon	C	14	6400 yr.	0.154	none
Cobalt	Co	60	5.3 yr.	0.30	1.10, 1.30
Zinc	Zn	65	250 d.	0.40	1.10
Calcium	Ca	45	180 d.	0.30	none
Sulphur	S	35	87.1 d.	0.17	none
Iron	Fe	59	47 d.	0.26, 0.46	1.10, 1.30
Phosphorus	P	32	14.3 d.	1.69	none
Iodine	I	131	8.0 d.	0.60	0.37, 0.08
Copper	Cu	64	12.8 hr.	0.58	1.20
Sodium	Na	24	14.8 hr.	1.40	1.40, 2.80
Potassium	K	42	12.4 hr.	3.60, 2.10	1.50

TABLE II

Some uses of isotopes by industries in the United States

Isotope	Uses
C^{14}	—A study on laboratory animals to determine the toxicological effects of some common chemicals which are used widely
	—The radioactive gage, using C^{14}, makes it possible to gage a sheet of Pliofilm or other film continuously as it comes from the rolls
	—Hydrocarbons typical of petroleum compounds are labelled with this isotope and are subjected to catalytic processes
	—To follow course of particular carbon atoms in complex catalytic hydrocarbon reactions —In special analytical problems where detection of radioactivity was the only practical analytical procedure
Co^{60}	—To study the permeability of naturally occurring or artificially produced porous media to the flow of oil, gas and water mixtures —As a high energy gamma-ray source for radiography
S^{35}	—To study mechanism of vulcanization of rubber —To study colloids and colloidal electrolytes —To study the role of sulphur in the coking process for the steel industry
P^{32}	—In assessing the effectiveness of fertilizers —To measure the amount and location of phosphorus in steel and alloys —To improve rubber abrasion tests



RADIOACTIVE GAGE
JAUGE RADIOACTIVE

make possible radioisotope tracing which will solve problems hitherto not susceptible to attack by chemical or spectrographic methods. In tracer work it is often possible to detect as little as 100,000 atoms, which is about a billion billionth (10^{-18}) of a gram.

Radioisotopes should find many important uses in industrial research. Already a number of industrial organizations in the United States are using tracer atoms in research covering such a scope of topics as friction, lubrication, diffusion, steelmaking, vulcanization, polymerization, catalysis, organic synthesis, etc. Availability of pile-produced isotopes opens up a whole new field in industrial research and at present it appears certain that they will play an important role in petroleum engineering, in chemical engineering, in metallurgy, in synthetic rubber research, in pharmaceutical investigations, in radiography and in industrial hygiene. Some idea of the scope and variety of the applications of radioactive isotopes to industry can be obtained from a study of Appendix I of the Fourth Semi-Annual Report of the United States Atomic Energy Commission, and some of this information is summarized in Table II (see page 3).

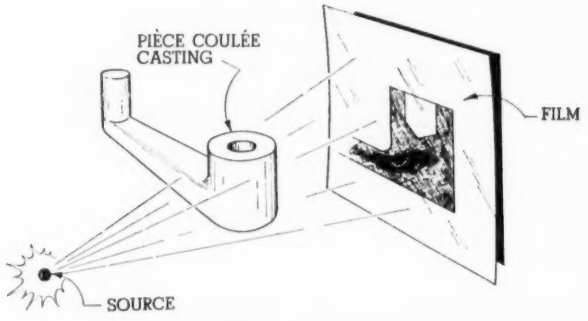
Radioisotopes may also prove to be important in process control, but at present most applications of this type are still in the development stage. The slower expansion in this phase of industry is because of the problem of ***radiation protection*** with respect to industrial hygiene and general safety of the public. The very radiations emitted by isotopes, which make them so useful in tracer work, also makes it necessary to handle them with considerable care. For example, in using radioactive isotopes in process control it is not only essential to be sure that they are handled safely throughout various steps of the process, but also to be certain that they do not enter a marketed product unless at some very safe level of activity. Expansion in this field will likely depend upon the speed at which technical personnel in industry become trained in isotope techniques and familiar with the general safety precautions involved in handling these substances, commencing at first with small-scale laboratory experiments.

Industry has already shown a marked interest in the use of pile-produced radioactive cobalt (Co^{60}) for radiography. For example, cobalt 60 can be used to test welds or cast parts. The cobalt 60, carefully sheathed in aluminum, is placed adjacent to the metal structure and its radiations allowed to impinge against the weld or part. The degrees of exposure of a photographic plate placed on the opposite side of the test section will show the location of any existing fissures or flaws. In some cases, a small amount of cobalt 60 should be able to do the work of a large X-ray unit, as radium sometimes does at present.

Isotopes will assist industry in determining and regulating the thickness of a rapidly moving sheet or film, as in the paper or rayon industries; in the detection of obstructions in pipelines; in determining the height of a liquid in a sealed tank; in finding irregularities or corrosion in a pipe; in dissipating incidental, harmful electrostatic charges on machinery and in many other ingenious ways. More details about possible applications of radioisotopes to industry are found in the bulletin on "Industrial Uses of Radioisotopes", published by the Isotopes Branch, Atomic Energy Project, Chalk River.

HAZARDS AND PRECAUTIONS

Some of the possible industrial applications of radioisotopes have been considered briefly in the first part of this paper and an attempt will now be made to indicate some of the chief hazards involved, and precautions necessary in the use of isotopes. Experience with radioactive materials has shown that there is considerable danger to the health of people working with these special substances unless proper precau-



RADIOGRAPHY
RADIOGRAPHIE

tions are taken. To make certain that workers at atomic energy projects are not harmed in any way, a new branch of applied physics, known as health physics in the United States and health radiation in Canada, has been developed. This new field of work is defined as "knowledge of the potential dangers presented by all radioactive materials and the means of combatting them". The Health Radiation Branch of Canada's Atomic Energy Project at Chalk River has two chief functions. These are:

1. To protect all personnel on the project from harmful radiations.
2. To keep certain areas of the project free from radioactive materials.

This second task is known as contamination control and is very important from the standpoint of the efficient operation of the plant.

Medical doctors and research scientists have been working with x-rays and radium for about forty years and in that time they have discovered much information regarding the effect of x-rays, gamma rays, alpha and beta particles upon the human body. As a result of the experience gained in working with radium and from certain experiments with animals, it is now fairly well established how much radiation the body can receive without permanent injury.

EXPOSURE OF THE WHOLE BODY TO GAMMA RADIATION

Gamma rays and x-rays are very penetrating, and excessive amounts of these radiations can do serious harm to the body. It was, therefore, decided by the management of the Atomic Energy Project at Chalk River that no person should receive more than a certain very small amount of radiation, which is known as a daily permissible dose. Upon joining the Atomic Energy Project every person is given a chest x-ray as part of the medical examination and the extremely small amount of radiation received at that time is almost equal to one-half of the daily permissible dose.

Scientists have worked out a unit, known as the roentgen, for measuring x and gamma radiation. This unit is usually represented by the small letter "r". The exact scientific definition of the roentgen can be found in books on radiology. According to our present knowledge 0.05 r per eight-hour day whole body exposure to gamma radiation is considered to be safe as far as any bodily injury is concerned, when there is no other type of radiation exposure.

In working with substances which emit gamma rays, every effort should be made to prevent personnel from being exposed to the rays unduly and the following figures may be useful in this connection. The intensity of 1.5 Mev gamma rays is diminished by 50% for every 0.5 inches of lead used as shielding. For isotopes emitting gamma rays with an energy of 0.8 Mev, the intensity of the rays is reduced by 50% for every 0.25 inches of lead interposed and only 0.125 inches of lead are needed to diminish the intensity of 0.43 Mev gamma rays by 50%.

The question arises at once as to how the exposure of personnel to gamma rays can be measured. The best method of checking or monitoring personnel is by means of films.

Gamma rays or x-rays bring about certain chemical changes to the compounds (silver salts) in a photographic film, so that the film will be black when developed and fixed. This fact can be used in the detection of gamma rays. The degree of blackening can be measured accurately at the end of a week by a photo-electric eye (densitometer) and recorded in terms of "r". In those cases where it is known that persons have received more than their permissible weekly dose (0.3 r), an investigation should be held by the management of the plant as to the cause of the over-exposure and the person who suffered such an over-exposure should be kept away from radiation until his body has had a chance to overcome any possible damage.

The film method of personnel monitoring gives a weekly check on the radiations received by the body. In some work where a person may receive his weekly permissible exposure in less than six days, it is wise to wear a penciltype ionization chamber. Special wrist films should also be worn by personnel when working in comparatively high radiation fields.

EXPOSURE OF BODY TO BETA RADIATION

When the body is exposed to an external source of beta radiation, only the top layers of the skin up to a few millimeters in thickness are irradiated. However, for safety, the limiting general exposure to external beta radiation should be taken as 0.30r per week in the surface layers. The outermost layer of skin is considered to be a dead hornified layer which acts as a filter, and the permissible tolerance is set for the zone below this.

Protection against radiation from most beta emitters is given by the walls of the glass vessel containing the isotope. Plexiglas, about three-eighths of an inch in thickness, serves as a good shield against beta rays and Lucite or lead glass about one-quarter of an inch in thickness are also satisfactory shielding materials for beta radiation. Personnel should be careful to avoid exposure to the radiation at the open top of a container. It should also be realized that the eyes are vulnerable to beta rays and protective goggles should be worn for all processes which involve exposure to intense beta ray emitters.

DEPOSITION OF RADIOACTIVE MATERIALS IN THE BODY

Many radioactive isotopes are dangerous in very small amounts when taken into the body. There are four ways this may happen. They are:

1. By ingestion.
2. By inhaling air containing radioactive materials.
3. By absorbing a solution of a radioactive substance through the skin (e.g. uranium salts).
4. By absorbing isotopes into the blood stream through a fresh cut or break in the skin.

The permissible amounts, known as tolerances, of radioactive materials which can be taken into the body are very small and all possible precautions should be taken to avoid getting these substances into the system.

HEALTH INSTRUMENTS

In addition to the use of films and pencil chambers, various kinds of electronic instruments are now available commercially to detect gamma rays, alpha particles and beta particles. These health instruments are very sensitive and are of great assistance in finding the location of radioactive materials and detecting radiation leaks which might be harmful to personnel.

VENTILATION

All operations involving radioactive isotopes which are exposed to the air or which are in containers which might break during the operation should be conducted in hoods which will be provided with forced ventilation sufficient to keep the beta active content of the working area below 10^{-7} curies per cu.m. or 3,700 disintegrations per sec. per cu.m. Sometimes no thought is given to the fate of the radioactive material after it is pumped out of a building. Personnel outside the factory must be protected from the radioactive material forced out of the stack leading from the hood system and careful consideration should be given to this when designing that section of an industrial plant where radioactive materials will be used. Hoods with individual filter systems for the exhaust air are highly recommended.

EQUIPMENT

Special equipment suitable for the type of isotope and level of activity being used should be provided for each type of operation. This should include handling tools such as tongs, forceps, trays and mechanical holders. Long-handled tools may provide adequate protection by distance where millicurie amounts of beta or gamma activity are encountered. When the isotopes concerned are chiefly beta emitters, efficient use can be made of transparent plastic shields fitting closely around the equipment to allow close handling with good visibility.

Containers for the active material should incorporate the necessary shielding as close to the source as possible. Containers for liquid samples should always be reinforced by an outer, unbreakable container.

CONCLUSION

Radioisotopes are now available to Canadian industry and, on the basis of experience already gained with them in the United States, there should be many useful applications in this country. Medical men and scientists have discovered during the last 40 years that radioactive substances can cause serious harm to people unless certain precautions are taken. It is essential that industry becomes aware of the hazards involved in the handling of isotopes and that suitable precautions are always observed.

An attempt has been made in this paper to point out the chief hazards and some general precautionary measures. However, each specific application must be considered separately from the health standpoint in order to decide the appropriate precautions.

Each new technical advance brings with it problems in the field of industrial hygiene and the introduction of radioisotopes into industry will, indeed, present a number of challenging health problems.

Undergraduate Medical Training

In Occupational Medicine and Hygiene

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INTRODUCTION AND SCOPE OF OCCUPATIONAL MEDICINE AND HYGIENE:

In recent years much emphasis has been placed on the teaching of "social medicine", a term considered to be a better description of the field of study included under the title of public health and preventive medicine. Social medicine is concerned with the social position of the individual patient and with his reactions to the environment in which he lives. It is urged that the medical student should be taught to think *first* of the patient as an individual, whose normal health is in some way disturbed by conditions in his environment and to understand that different patients may react quite differently to similar environments. To inculcate this viewpoint no subject in the medical curriculum is better adapted than occupational medicine and hygiene. The scope of "occupational" medicine, which is a more inclusive term than "industrial" medicine, includes the preservation of health in the working environment, the prevention of occupational disabilities and methods for the rehabilitation of workmen incapacitated by accident or disease.

NEED FOR INSTRUCTION IN OCCUPATIONAL MEDICINE AND HYGIENE:

Throughout the centuries the study of man's relationship to his environment — whether it be the physical, geographical, socio-economic or occupational environment, has steadily progressed and, in modern times, physicians recognizing that the nature and extent of ill-health are largely influenced by environmental factors, have directed their efforts to preventing disease, promoting health and prolonging life.

To equip the future medical practitioner with a sound basis for his endeavors a number of didactic lectures suitably illustrated with hospital case reports and lantern slides should be combined with visits to industrial plants.

The following plan of lectures, developed during several years of teaching experience in a Canadian university, has been found helpful to the undergraduate medical student:—

1. Importance of occupational hygiene and its advantages to employer, employees and the community.

It is emphasized that the health of workers is of paramount importance to the management of industrial companies for, although the burden of sickness weighs heavily upon the workers themselves in suffering and economic loss, it recoils on the industrial management. Sickness and physical incapacity among workers, whether causing absence from work or not, is a costly factor in diminished production, spoilage of goods, labor turnover and low morale. The ***employer,*** therefore, should be acquainted with the principles of health maintenance in industry. Industrial processes where heat, dust, smoke and fumes are evolved and poisonous substances used, shorten the lives of industrial workers as compared with agricultural workers and the remedy for much of the trouble is pure air. The ***worker*** must also be trained to understand and avoid the peculiar hazards of his job. Appreciation of the hazards enables the worker to avoid them and in industrial plants two types of hazard — the accident hazard and the health hazard — require consideration.

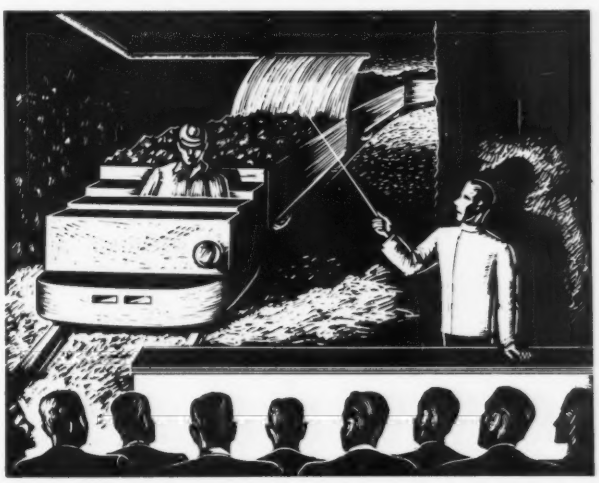
2. Industrial Health Services: scope and facilities for small and large plants.

A program for medical services in industry includes a physical examination for placement at work, periodic physical examinations, the reporting of minor complaints of ill-health to the plant dispensary, supervision of working conditions, rehabilitation of employees after sickness or accident, health education, first aid and care of accidents. The part-time physician has responsibility for the maintenance of the health of the employees and should visit the plant at regular intervals, conducting the preventive aspects of his program personally and referring employees requiring systematic treatment to the family physician. He has important relationships within and wihout the plant. He should be responsible to the executive officer and work in close cooperation with the personnel and employment departments. High professional standards combined with genuine interest in the problems of employees establish confidence and ensure the success of an industrial health service. He should maintain intimate contact with the family physician. Most employees are at work in small factories, so that the plant physician generally continues in practice and serves industry in a part-time capacity. He should be alert to preserve contacts with public health agencies so that the efforts of vountary and official agencies in various fields of health conservation — control of tuberculosis, venereal disease, cancer and occupational diseases — may be concentrated on his own group of employees.

3. General hygienic factors of the occupational environment.

A variety of factors are considered:—

(i) Temperature, humidity and motion of the air. The health,



comfort and efficiency of the worker are greatly influenced by the physical factors of the environment; and the study of these influencing factors to determine comfort conditions during the winter and summer months requires the use of the Kata-thermometer, the sling psychrometer and the velometer.

(ii) Purity of the air. Factory air should be reasonably free from dust, gases, fumes, odors and bacteria. Types of air sampling apparatus for determining concentrations of dusts and gases are explained.

(iii) Illumination without glare. Adequate natural and artificial lighting in factories is beneficial in the prevention of eyestrain, in improving the quality and accuracy of work, in stimulating production and in reducing the number of accidents. The fundamental principles of proper lighting of workrooms, the use of different types of electric light bulbs and the measurement of light intensities at the working level by the foot-candle meter, are determined.

(iv) Ventilation and air-conditioning. Ventilation must always be sufficient to remove excessive heat, dust and fumes and to render the industrial processes safe. Mechanical ventilation must be resorted to in crowded rooms to remove vitiating elements at the source of production, for, if diffusion into the air of the room is permitted, a large quantity of fresh diluting air will be necessary.

(v) Noise control. The decibel is the unit of measurement of sound; the higher the number of decibels, the louder the sound. The reduction of undesirable sound may be accomplished by (a) insulation, e.g., placing of vibrating machines on damping pads, (b) isolation, e.g., enclosing of noisy machines or processes, (c) use of sound-absorbing material on walls and ceilings in rooms where machines and processes cannot be isolated and (d) efficient maintenance of equipment, e.g., loose-running equipment frequently causes unnecessary noise.

(vi) Sanitary facilities — safe water supply, toilet facilities, dressing and locker rooms.

4. Special hazards in occupational diseases and methods of prevention and control.

Most occupational diseases are due to the inhalation of dust, fumes or gases or to contact of the skin with irritating substances. These diseases may be grouped as due to

(a) mineral dusts, e.g., silica, asbestos, talc.

(b) metallic dusts and fumes, e.g., lead, arsenic, chromium, cadmium and mercury.

(c) gases which are ***irritating*** to the upper respiratory tract and therefore give warning of their presence, e.g., sulphur dioxide, ammonia and chlorine, and gases which are ***non-irritating*** to the nose and throat and therefore may be inhaled, e.g., carbon monoxide, nitrous fumes, sulphuretted hydrogen and hydrocyanic acid gas.

(d) volatile solvents — the aromatic hydrocarbons — benzol, toluol, xylol; — the chlorinated carbons — carbon tetrachloride and trichlorethylene.

(e) skin irritants, e.g., alkalis frequently used for cleansing metal or textiles and volatile solvents used for degreasing purposes.

(f) occupational cancer.

5. Legislation regarding occupational diseases: the Workmen's Compensation Act in Canada.

Occupational diseases may be compensated for (a) as accidents (b) on the basis of a general provision whereby all occupational diseases are compensated or (c) in accordance with a specified list of occupational diseases in certain industries.

Administration of the Workmen's Compensation Act in Ontario. Aims: The Ontario Act may be termed "Employers' Insurance at Cost," because (1) it provides protection to Ontario industries against the cost of accidents to employees arising out of and in the course of their employment and of certain industrial diseases included in schedule 3 of the Act and (2) it provides for the injured workman two-thirds of his average earnings during the period of disability as a result of an accident, as well as full medical aid. Medical aid includes medical, surgical and dental aid, hospital and skilled nursing services, and artificial members or appliances and their maintenance in repair for a period of one year.

Scheme of assessment: The method of obtaining money to provide for these benefits to injured workmen is by assessing the employers a certain rate on every $100.00 of wages they pay out. The amount varies according to the previous year's experience of the cost of accidents in each particular class of industry, and is increased or decreased each year in accordance with the cost of the accidents for the previous year. In Ontario 70,000 accidents occur yearly on an average, and $1,250,000 is paid annually.

Choice of doctor: When the Act was framed, and as it still stands, the Board has authority to arrange for necessary medical aid, but has not exercised its prerogative in this regard, and at present every qualified medical practitioner in Ontario who is licensed to practise is eligible to treat Compensation Board cases. If a workman receives an injury the employer and the employee should agree on the doctor to be chosen and there is usually no difficulty in a suitable medical practitioner being selected.

Duty of employer: When an accident occurs it is the employer's duty to forward a report to the Workmen's Compensation Board giving full particulars of the injured workman, describing how the accident occurred, stating the name of the doctor to whom the workman was sent and the name of the hospital, if such should be necessary, etc. When this report is received at the Board's offices, an account form is sent to the doctor immediately. Should the indication be that the injured workman will be off work for a period of seven days or longer, a surgeon's first report form is sent to the workman, who should take it to his doctor to be completed and returned to the Board's offices. If the workman's injury requires medical attention, the Board will pay the expenses, irrespective of whether the injury necessitates absence from work or not, but compensation is only paid to the injured workman when his injury necessitates absence from work for seven days or longer.

Duty of doctor to Workmen's Compensation Board: The Board expects claimants under the Workmen's Compensation Act to be given efficient medical and surgical attention, and payment is made for such services in accordance with a schedule of surgical fees which appears on the back of every account form. The wording of the Act states that the Board will pay for necessary medical aid, and it must be evident that the only way the Board can ascertain what services should be necessary is from the doctor's reports furnished to the Board during the progress of treatment. In the less-than-seven-day cases, the doctor is not requested to complete a surgeon's report form; therefore, full particulars of the condition found and the treatment given should be entered on the doctor's account form. In lost-time accidents where the doctor completes a surgeon's first report and progress reports, these should be sufficiently full and complete to enable the Board's officers to approve of the accounts presented by the doctor.

Progress reports: Compensation cheques are sent every two weeks to the claimant and his family and these cannot be issued without the necessary reports signed by the doctor. Prompt attention to progress reports is therefore essential for the satisfactory administration of the Act.

FIELD VISITS TO SELECTED INDUSTRIAL PLANTS.

It is important to ensure the proper conduct of a visit by medical students to an industrial plant. The class assembles as a group in one of the larger rooms, ordinarily used for lectures or film projection, at the plant offices. A preliminary outline is given of (1) the duties of the medical department *by the plant physician;* (2) the mode of inducting a new employee — if the result of a complete medical examination including blood tests, urinalysis and chest x-ray is satisfactory — and the company's insurance policies *by the personnel manager* and (3) the "safety first" program and the chemical processes in the various departments *by the plant foreman.* Blank record forms used by the medical and personnel departments and booklets describing the group insurance and retirement plans are distributed to the members of the class which is divided into groups of eight students for convenience in making a tour of inspection. Each group is under the guidance of a supervisor who explains the main features of the sections visited. After completing the tour the groups reassemble and any questions raised by the students are answered by the original panel of officials.

A model plant, employing 750 persons, in which nylon is manufactured has provided an opportunity of inspecting the design and operation of a medical department — the doctor's office and his system of filing confidential medical records, the rest-rooms, x-ray room, laboratory and physiotherapy room, pre-employment and periodic medical examinations, the weekly courtesy visits made by the nurse to employees absent from work on account of illness and the impetus to encourage workers to report minor illnesses or injuries. In this way the medical department comes to be regarded not merely as a first-aid room but as a health centre for plant employees. In addition other important features of good plant supervision are demonstrated, such as adequate lighting without glare, efficient ventilation, safety measures, air-conditioning units for special operations and food sanitation in the cafeteria.

Other industries which have been found suitable for field visits include a modern plant for the fabrication of aluminum, a factory for the manufacture of wall and floor tile and an industry producing storage batteries. These industries exhibit various contrivances for the prevention of accidents, measures designed to eliminate the danger of silicosis and lead poisoning, and schemes for health supervision of employees and for prompt medical attention to injured workmen. Students submit detailed reports of their field visits which are returned to them after being reviewed.

ADVANTAGES TO THE FUTURE MEDICAL PRACTITIONER OF STUDYING OCCUPATIONAL MEDICINE AND HYGIENE.

Approximately five million persons are employed in industry, farming and commerce in Canada, and the health of this population group is a direct concern of practising physicians. The future medical practitioner, whose patients will be drawn largely from persons in these various pursuits, should derive benefit from a course of instruction as here outlined to enable him to evaluate the influence of environmental factors in illness. The application of preventive medical services to a group of industrial employees is an extension of the health supervision exercised during school life — a principle with which he is already familiar.

An introduction to the administration of the Workmen's Compensation Act should help him to play an intelligent part in the care of the injured workman, in his duty to the Workmen's Compensation Board, in his relationship to the employer and in humanitarian interest in the welfare of the patient's dependants. The technique of conducting physical examinations in the appraisal of health status and in the detection of remedial defects should appeal to the interested student. He should be quick to appreciate the opportunity he will have of studying the health of large groups of patients year after year to detect, if possible, the earliest stages of such diseases as cancer, tuberculosis and cardio-vascular-renal disease. The recognition of disease in its inception is a necessary prelude to prevention or effective cure.

Editor's Note: An important factor governing the future expansion of industrial health services is the facilities for professional training in the field. Are Canadian facilities for undergraduate courses in industrial medicine and hygiene adequate to meet the increasing need for trained personnel? Dr. Wyllie has described undergraduate medical training in industrial medicine at one of our universities. The opinion of those interested in this field would be welcomed as other aspects of this subject will be dealt with in subsequent issues.

Nurses in Convention

Of far-reaching significance was the session for industrial nurses at the 1949 Annual Safety Convention of the Industrial Accident Prevention Associations held in Toronto on April 5th. At this meeting, which took place in the Roof Garden of the Royal York Hotel, recognition of the important place of the industrial nurse in any effective program was evident.

The contribution which she is able to make towards the general health of employees through health education was referred to by the chairman of the afternoon, Mr. E. Keith Davidson, James Davidson Sons, Ottawa. He stated the opinion that a nurse who confines her activity to first aid in accidents is missing an opportunity for health service which can be of benefit to the employer, the employee and the community as a whole. On a visit to the dispensary an employee is receptive to health teaching, more so than in other situations. A film ***Fifteen minutes to Go*** gave a vivid presentation of infection in an open wound.

Dr. W. S. Deadman, Director of Laboratories, Hamilton General Hospital, Hamilton, in discussing his subject "Rendering a Service" presented the roles of the industrial nurse, the employer and the employee, not merely as members of an industrial organization but as citizens in an industrial country. He stressed the fact that everything which the nurse can do towards promoting developments for service within the plant will be a definite contribution to better health conditions in the country. Some discussion of specific problems encountered by the industrial nurse followed this address.

That there is an ever-growing appreciation of the value of the industrial nurse is evidenced by the fact that this session devoted to her part in the prevention program has been on the agenda of the Annual Safety Convention for the last four years. Doctors, nurses, plant manager, personnel managers and safety officers are all interested and attend these meetings in large numbers.

Each industry or plant is responsible for accident prevention. An effective safety program combines the work of safety engineering, the nursing profession and the medical profession and, proper placement through the personnel department. An opportunity, therefore, for industrial nurses to meet in session and share experiences is a benefit to all persons who are interested in rendering service to workers.

Margaret H. Wilton
Division of Industrial Hygiene
Ontario Department of Health.

The Plant Inventory

A GUIDE TO INDUSTRIAL HYGIENE PRACTICE

By SARTO R. PLAMONDON, B.A.,Sc., C.E., S.M.
Division of Industrial Hygiene
Quebec Ministry of Health

If we are proud of industry's rapid development we cannot ignore the problems which have resulted, especially the dangers of industrial diseases to which workers may be exposed. These diseases are assuming more importance as our knowledge of them accumulates.

For centuries it has been observed that workers engaged in certain operations were afflicted with identical illnesses which could only be attributed to their occupation. Mechanization of industry has greatly extended the hazards of work. The increase in the degree of exposure to toxic substances has resulted in a greater number of persons exhibiting symptoms of illness. Moreover, it must not be forgotten that achievements in the physical and chemical sciences have helped to produce a great number of new raw materials for industry. Among them are an increasing number of dangerous substances. This fact is reflected in the lengthening list of maximum allowable concentrations as adopted each year by the American Conference of Governmental Industrial Hygienists.

As the number of toxic materials multiply accompanied by a rising occupational disease potential, the problem of applying adequate preventive measures becomes more urgent. Governmental agencies such as the Division of Industrial Hygiene can only supervise part of this large task. Industrial management has its share of responsibility and it is only with industry's collaboration that an effective control program can be achieved. Management can help to prevent unnecessary exposure of employees by maintaining an up-to-date inventory of all substances, processes and conditions encountered in plant operations.

As a business man, no manufacturer neglects his accounting for it is the foundation of his enterprise. Human capital, that is the employee, can be evaluated for industry and its yield is found to be directly related to the conditions of work. If the worker is exposed to occupational diseases through the employer's lack of foresight, production will be adversely affected by the loss of time and skill involved. Sometimes the reputation of the particular plant will be marred. This can be transcribed into the company's accounts in dollars and cents. Progressive industrialists realize that expenditures in this field yield the greatest returns.

Potential industrial health hazards can be evaluated by a survey of the substances and processes used and the conditions of work existing in the plant. A complete inventory of all these factors should be made and examined to see if any are known or suspected to be injurious to health. In every plant a responsible employee with some experience in plant operations, such as the safety officer, should be assigned the task of preparing the plant inventory. The inventory should be planned and carried out in a systematic manner. The processes and substances used in each particular location should be carefully recorded and the possible associated hazards and efficiency of any control measures indicated.

In establishing the degree of danger, if any, associated with each substance and process, advice from medical and engineering personnel familiar with industrial hygiene practices will be required. In Quebec most plants have no professional personnel on their establishments and can obtain the necessary technical information and advice from our Division of Industrial Hygiene.

The Division will review the plant inventory and indicate those materials which are known to be toxic. In some cases a trade product of unknown composition will have to be identified through a trade-name index or by chemical analysis. Having listed those factors in the plant operation that are potentially hazardous, the necessary control measures can then be determined and applied in the plant.

Regulations of the Province of Quebec relating to industrial establishments require that toxic components in a product be indicated on the label of the container.

These regulations are as follows:

Article 48 "Wherever lead and its compounds, benzol and its derivatives, arsenic and its compounds, hydrocyanic acid and its compounds are prepared for use for any purpose, and in all industrial processes in which these substances may be used, special precautions must be taken to effectively protect all persons using them or exposed to contact with them."

Article 49 "Manufacturers must see that all packages containing the substances mentioned in the preceding article and intended for use as ingredients or raw materials in industry shall carry a label indicating in bold legible type: 'This package contains lead' ^ (or arsenic, mercury, hydrocyanic acid or benzol as the case may be).

If this regulation could be applied in all cases it would become much easier to control industrial diseases. Unfortunately, much remains to be done in this field as there are many objections to this procedure. In the meantime, we believe that this approach will assume increasing importance among the efforts to control industrial diseases.

A Manual for Industrial Nurses

The *Industrial Nurse's Manual* prepared by Dr. M. F. McGavin, Chief Medical Officer of the Ford Motor Company of Canada, describes the various nursing procedures required for industrial nursing practice. Written by an experienced industrial physician, the manual clearly outlines the extent and limits of the nurse's duties, indicating those services which are the physician's responsibility.

The Committee on Industrial Medicine of the Canadian Medical Association has adopted for use *Standing Orders for Nurses in Industry* developed by the Council on Industrial Health of the American Medical Association. The present manual, in expanding upon the nursing principles enunciated in these standing orders, is a valuable guide in defining the relation between the physician and nurse in industry. It should be welcomed by both professions as a practical outline of the industrial nurse's duties.

The manual consists of two sections and describes many of the situations which the nurse is likely to encounter in industrial practice. The first section on general procedures in emergency care includes the following subjects:

Control of Haemorrhage: direct and indirect methods.

Restoration of Breathing: preparation of patient, Schafer method, mechanical devices.

Shock Prevention: primary and secondary shock, treatment in early shock prevention.

Prevention of Infection.

The second section is devoted to routine nursing care of injuries under the following headings.

Wounds and Abrasions

The treatment of minor and major lacerations, redressing of suture cases, puncture wounds, complications including infection, severed tendons, nerve injury, haemorrhage and scars.

Contusions

Treatment of minor cases and of the various complications resulting from blows and falls.

Strains and Sprains

Elementary diagnosis and treatment of (a) acute type, (b) type caused by continuous occupational stress such as tenosynovitis, trigger finger and ganglion.

Orthopedic sequelae

Fractures, dislocations, and cartilage damage in the knee.

Burns

Treatment of minor burns and emergency care of large burns including shock prevention; chemical burns.

Injuries of Special Areas of the Body

(a) Eye injuries—standard ophthalmic procedures including type and care of equipment, procedure for examining eyes, treatment for various eye injuries.
(b) Head injuries.
(c) Chest and abdominal injuries.

Dermatitis

Classification of dermatitis; management of cases.

Non-Occupational Illnesses

Standing orders for various conditions including fainting, fever, respiratory infections, abdominal distress and dysmenorrhoea.

Since each subject is treated in a clear and concise manner the present manual represents a valuable guide to nursing in industry based on the experience of the writer. It should be of particular assistance to physicians and nurses who are concerned with the establishment or extension of health facilities in industry.

In commenting on the qualifications of the industrial nurse, Dr. McGavin makes this thoughtful observation: "The successful industrial nurse primarily must like people, have a broad understanding of them, and a sincere desire to help them. Basically, sound clinical judgment with good technical skill and knowledge of one's ability and limitations are necessary qualifications. This is not readily obtainable when first entering the field of industrial nursing and is only acquired through considerable experience and continued careful observation".

Group Medical Services FOR SMALL PLANTS

An industrial Area in England establishes a group industrial health service for its factories

INDUSTRY in Canada is composed largely of small units employing less than 500 persons. Organizations of this size frequently find it difficult to provide a complete health service at a reasonable cost. It is important, nevertheless, that small units enjoy the benefits to be derived from an efficient plant medical department. A promising approach to this problem is a group medical service for several small plants. A decisive reduction in costs can be achieved in this way by the sharing and optimum deployment of staff and facilities. An example of this method is reported from England and a similar approach appears to be practical in many areas in Canada.

The Slough Industrial Health Service was developed to provide facilities for a group of industries in the Slough area of Bucks, England. The first annual report of this plan (1948) contains full and valuable information on the organization, administration and progress of the scheme. It is an important contribution to the field of industrial medical planning. The following extracts from the section prepared by the medical director — Dr. A. Austin Eagger, C.B.E., M.B., Ch.B. — will indicate the comprehensive nature of the experiment.

"There are some 300 factories in the area of Slough, with a total of over 30,000 employees. The main industry is light engineering, but many other types of trades and industries are represented. Two hundred of these factories, with approximately 20,000 employees, are concentrated on the Slough Trading Estate. The environmental conditions in the factories on this estate, which was developed after the First World War by Slough Estates Limited, compare very favorably with those found in small firms in other parts of the country. Factories vary in size from 1500 square feet to 100,000 square feet, employing from ten to a thousand workers.

It will be appreciated that in initiating a scheme of this nature many difficulties have been encountered which affect the attainment of the objective. These include:

(1) Liaison with the management and workers of a hundred firms presents a totally different problem from that presented by one firm employing a total of 11,000 workers. The task of maintaining contact with individual managements and ascertaining their constantly changing medical requirements is a difficult administrative problem. Many managements feel that the contribution which they pay to the National Health Insurance should cover industrial health, and that the provision of a first-aid box and the appointment of a first-aid worker is all that should be expected of them. In the case of the small firm with comparatively little capital, this is a difficult argument to refute.

(2) The maintenance of a full-time readily available emergency service is expensive in both medical and nursing staff.

(3) The shortage of clerical staff in the small firm makes it difficult to obtain records of any kind.

(4) Pre-employment examinations are regarded with suspicion by workers, and their value not realized by managements.

(5) Managements are not acquainted with the ethical rules of the medical profession and resent workers being referred to their personal doctors for treatment which they consider should be carried out by the service.

(6) Excellent relationships have been established with general practitioners in the area, but it must be realized that some practitioners feel very strongly that they alone should be responsible for the treatment and examination of their own industrial patients.

GENERAL ORGANIZATION

(a) Central clinic. At this clinic the undermentioned departments were established and equipped:

1. Reception.
2. Treatment.
3. Resuscitation.
4. Examination.
5. X-ray.
6. Physiotherapy.
7. Chiropody.
8. Orthopaedic.
9. Records.
10. Administrative.

In addition, a rest room for the staff and a storeroom were provided. Experience has shown certain defects in the original layout of this clinic, but on the whole this adaptation of the building has proved to be satisfactory.

(b) Ambulance posts. One ambulance post was established in the vicinity of the centre of the trading estate, and a second on the south boundary. These posts provide facilities for treatment of accidents and sickness occurring in firms in their area. They are staffed by nurses of the service, and visited daily by a medical officer.

(c) First-Aid posts in member firms. The service maintains medical supervision of firms who employ their own nursing staff.

(d) Mobile dressing station. The mobile dressing station provides facilities for re-dressings and physical examination actually at the factory site, and thus ensures the minimum loss of working time.

(e) Accident service. In addition to the facilities provided by the clinic, mobile dressing station and ambulance posts for the prompt treatment of minor casualties and re-dressings, an accident van—suitably equipped—is held available to proceed to the site of any serious accident with a medical officer and nurse. Arrangements have been made with the St. John Ambulance Brigade by which ambulances are available on call.

(f) Transport. The comparatively wide area covered by the service makes the provision of adequate transport a necessity. Medical officers use their own cars, and a staff car has also been provided. Two driver-mechanics are employed who, in addition to driving, are responsible for maintaining and servicing the transport of the service.

STAFF

It was difficult at the outset to estimate the size of the medical and nursing staff which would be required for a service of this nature. The staff now includes the following members:

Medical Staff

Medical Director—responsible for general administration of the Service and in medical charge of patients in the Farnham Park Recuperative Home.

Deputy medical director—in charge of organizing the preventive side of the service by carrying out investigation into the various industrial problems in the area.

Casualty officer—responsible for the treatment of all cases of injury and sickness at work, assisted by other members of the medical staff.

Woman assistant medical officer (part-time)—in charge of treatment of female workers.

Attached Medical Staff

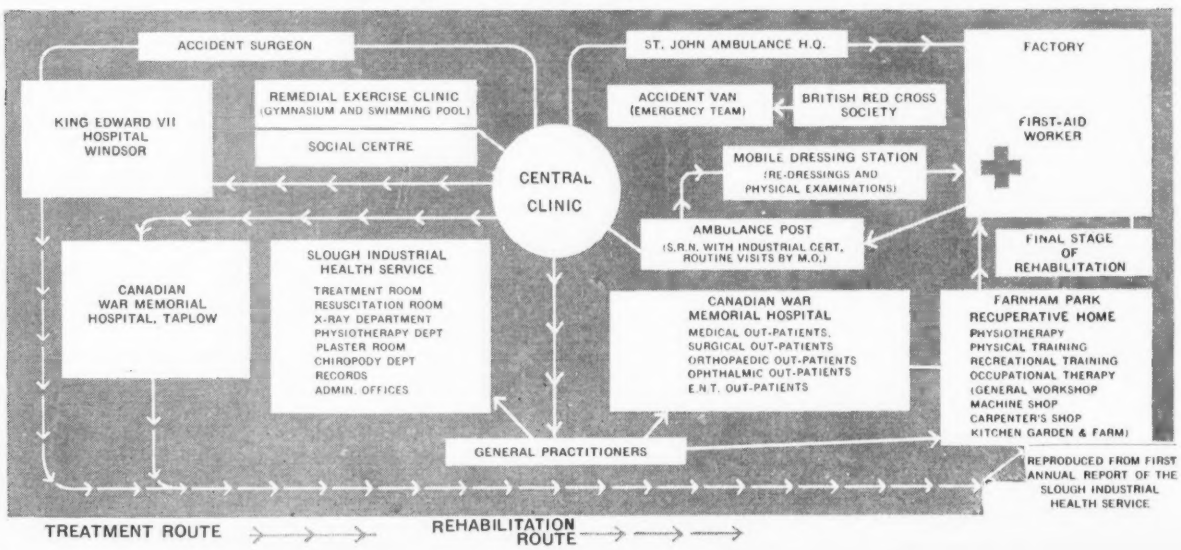
Accident surgeon on staff of local hospitals—holds weekly clinics at both the central clinic and Farnham Park, and is available for consultation and advice; responsible for the treatmen- of all injuries referred to hospital.

Examining surgeon for the area—provides the service with a full medical report of every juvenile entering industry in the area.

Nursing Staff

The nursing staff consisted of a superintendent of nurses, deputy superintendent of nurses, nine full-time registered nurses, one part-time registered nurse, one assistant nurse and one first-aid worker. The administrative responsibilities for a nursing staff of this nature are considerable, particularly if wastage of time of highly-trained nurses is to be avoided and efficient accident cover maintained over a wide area. The opinion of the Industrial Health Committee of the British Medical Association that no nurse in industry can be fully effective who is not responsible professionally to a medical officer, is strongly supported.

SLOUGH INDUSTRIAL HEALTH SERVICE



The ancillary staff includes two physiotherapists an occupational therapist, a remedial gymnast and a chiropodist. Nine persons are employed in general staff duties.

METHOD

The following routine has been adopted when a firm joins the service. The medical director visits the management and ascertains in what way the service can be of help to the firm, and in particular gains information with regard to any occupational hazards which are known to exist. The advantages of pre-employment and routine examination are stressed, and information obtained as to the existing sickness and accident rate. A detailed survey of each department of the firm is carried out, and the information recorded on the environmental survey form which has been adopted by the service. With the cooperation of management, an opportunity is taken to explain to workers the facilities which the service offers and how they can benefit by taking advantage of these facilities.

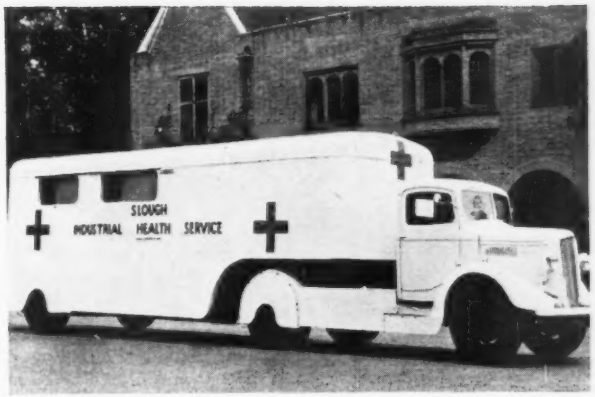
The superintendent of nursing discusses with the first-aid workers of the firm the action which should be taken by them in the initial treatment of cases, and the service accepts responsibility for the re-supply of first-aid boxes. In the event of a serious accident the firm is instructed that the central clinic should be informed at once, and the emergency team—consisting of a medical officer and nurse, with a fully-equipped accident van—will be available to take complete charge. The less serious case which is, however, beyond the capabilities of the first-aid worker, is referred to the central clinic or an ambulance post, depending on the locality in which the firm is situated. Subsequent re-dressings are carried out from the mobile dressing station if the factory is at any distance from the clinics of the service.

The firm is asked to appoint a workers' representative, preferably elected by the workers themselves. These representatives meet the medical and nursing staff of the service at a monthly meeting, when the progress of the service is reported, future developments discussed and constructive criticism and suggestions invited. Workers thus take an active interest in the organization of the service which has been instituted for their benefit.

Members of the medical and nursing staff visit the firm subsequently to discuss any difficulties which may have been met and to maintain contact with both management and workers.

PROGRESS

The central clinic and ambulance posts were opened May 1, 1947, and by the end of the month 52 firms with 6,324 employees had joined the service. Within 12 months these figures had increased to 99 firms, with 10,849 workers. In effect a third of the total number of firms in the area are now members, and while this can be regarded as an encouraging start, it is felt that a scheme which has such great possibilities for the benefit of industry should have the full support and cooperation of every firm.



FARNHAM PARK RECUPERATIVE HOME

The sponsors of the service fully recognized the importance of providing residential facilities for the rehabilitation of sick and injured workers and decided that a recuperative centre should form an integral part of the experiment.

Modern rehabilitation requires the active cooperation of the patient in his treatment, and at Farnham Park this treatment consists of work which is of both therapeutic and practical value combined with recreational training to develop physical and mental fitness.

The type of patient for whom the home is intended is one who should be capable of being restored to full earning capacity in a maximum of 12 weeks, or in the case of the permanently disabled, to such earning capacity as the permanent diasbility will allow. The minimum length of stay is three weeks and experience has shown that the average duration of stay is five weeks. Patients should be between the ages of 18 and 55 and may be of either sex. All must be ambulatory and able to dress and feed themselves, while cases of psychosis, severe neurosis and epilepsy are not considered suitable for admission.

Patients are admitted at the request of industrial firms, hospitals and members of the medical profession providing that, in the opinion of the medical director, the case is considered to be one which is likely to benefit by treatment in a centre of this nature. A charge of five guineas per week is made for each patient, and an undertaking must be given by a responsible authority that this charge will be met, as in no circumstances can this responsibility be placed on the patient.

The outbuildings provide suitable accommodation for workshops and these are being adapted for the

purpose. An attempt is made as far as the facilities will allow to give patients — both in occupational therapy and in physical training — treatment which will fit them for their particular vocation, but it must be realized that the aim of the centre is to get patients fit as quickly as possible and that in the majority of cases the duration of their stay is comparatively short. It is an undoubted fact that the carpenter or mechanic who is recovering from a short-term illness does not wish to be employed at his usual vocation, but welcomes the opportunity of widening his interests by being employed on other work, for example, gardening, and it is suggested that frequently this accentuates the rate of recovery and certainly is of psychological value.

On admission all patients are examined by the medical director and placed in one of four physical grades, and instructions are issued as to the particular treatment which each patient is to be given. Patients are re-examined at frequent intervals to observe progress and to be regraded, and after these examinations a conference is held at which the progress of each patient is discussed. This conference is attended by the medical director, matron, physiotherapist, occupational therapist and remedial gymnast. These in effect —with the general manager and secretary — are the senior members of the staff, responsible for the administration of the home and the care of the inmates.

The principle of continuity of treatment is maintained by referring all patients at regular intervals to the physician or surgeon who was initially responsible for the case, while every endeavor is made to carry out the final stage of rehabilitation in the particular industry in which the patient is employed.

The majority of patients on discharge from the home return to their former occupations. If this is not possible the service communicates with the individual firm concerned or with the disablement rehabilitation officer of the area to ensure that the patient does return to a specific type of work which he is fit to undertake.

A wide variety of cases have been admitted, and while surgical cases predominate, the importance of the rehabilitation of the medical case for industry is fully recognized and it is hoped that an increasing number of these cases will be sent to the home.

In occupational therapy a proportion of the patients have been given suitable work of therapeutic value in the garden, while others are employed on carpentry, rug weaving, light handicrafts such as leather work and model toy making. While specific treatments are given for various injuries, general treatment is provided to improve muscle tone and increase work tolerance. The need for the careful supervision of all treatments in occupational therapy and the careful graduation of work, particularly in medical cases, creates a difficult problem in obtaining suitably trained staff. Some work has been obtained from local firms, and it is hoped to gain increasing cooperation from managements in the area. The modern conception that patients should be gainfully employed while carrying out productive work of therapeutic value is difficult to implement in a centre of this type where the short stay and wide variety of conditions would produce inequalities of financial reward and possibly create resentment and ill-feeling.

Over 60% of admissions require physiotherapy, and the scope and interest of the work has been increased by the admission of the thoracic cases for which the Harefield method of specialized breathing exercises is carried out daily. Much of the treatment given is post-operative and is closely coordinated with occupational therapy and recreational training.

A well-equipped gymnasium, tennis courts and the extensive grounds provide excellent facilities for physical training and recreation which is carried out under the supervision of a remedial gymnast.

It is of paramount importance in a home of this nature that meals are adequate, well cooked and tastefully served, and every effort has been made to ensure that these aims are achieved in spite of the many difficulties which exist under present circumstances.

The suggestion that patients would be overawed by the somewhat palatial surroundings or fail to appreciate the amenities has not been confirmed, and it has been interesting to notice how patients from various grades of social life have combined together to form a happy community, and that the more seriously disabled are invariably given every consideration and help by those who are attaining full recovery.

The senior members of the staff meet representatives elected by the patients once a week and an opportunity is provided to discuss difficulties of administration and to obtain constructive criticism and helpful suggestions for the increased comfort and welfare of the patients. By thus gaining the cooperation of patients it has been found unnecessary to issue any list of rigid instructions while the standard of discipline has been exceptionally high.

Farnham Park is still in an early stage of development but the value to industry of a centre of this nature is already clearly indicated and the faith of the sponsors fully justified."

Health Effects ASSOCIATED WITH BERYLLIUM

A LITERATURE REVIEW

by

KINGSLEY KAY, M.A., Ph.D., Chief, Industrial Health Laboratory, Department of National Health and Welfare

Chemical and environmental evidence against certain beryllium compounds has been gradually accumulating during recent years. It is now generally accepted that improper contact with such compounds may lead to serious effects on health. In view of the growing industrial application of this element, careful attention to those whose work involves beryllium exposure becomes of utmost importance.

On the basis of European experience (1, 2, 3, 4) the International Labor Office recognized certain berryllium compounds as industrial poisons in 1938. Contemporary knowledge was summarized by Gelman (5) in the Office's official publication for that year, pathological data being drawn from observations on workers engaged in preparing beryllium metal from Beryl (BEO, AL_2O_3, $6SiO_2$). Among workers engaged in the preliminary operations of mixing beryl with sodium fluorosilicate and high temperature fusion of the mix, an irritant action on the skin was found and consisted of (1) erythematous and papulo-vesicular forms of dermatitis mainly on the face and neck; (2) ulcers on the fingers. Ulceration of the nasal septum with eventual perforation was also noted. It was considered that the fluorine content of salts was responsible for these effects. Respiratory attacks were suffered by workers engaged in the final processes of treating fusion products with hydrofluoric acid to form beryllium oxyfluoride which was subsequently electrolyzed. Attacks were in two stages (1) symptoms like metal fume fever due to zinc and related elements; (2) shortly after recovery from (1) a chemical pneumonitis involving dyspnea, cyanosis, and other signs which Gelman compares with chlorine poisoning. The first respiratory form of attack was considered to be due to fumes of beryllium metal, the second to release of fluorine from beryllium oxyfluoride at the levels of the bronchioles and alveoli.

CURRENT METALLURGY

Beryl continues to be the primary source of beryllium on this continent. In addition to the early extraction method described above, beryllium may also be obtained from the ore (1) by alkali fusion to yield basic beryllium carbonate. (2) by sulphuric acid fusion to yield beryllium sulphate. Beryllium metal is generally produced by electrolysis of the chloride, fluoride or oxyfluoride at high temperature in a melt of alkali or alkaline earth halides. Beryllium oxide is formed on ignition of basic beryllium carbonate. A common alloy is produced by furnace reduction of beryllium oxide in presence of copper.

PRESENT DAY USES

Wartime manufacturing developments brought beryllium into prominent use as a fatigue resistor in alloys with copper. Additionally, beryllium imparts anti-corrosive properties and high electrical conductivity. Hence it is employed in alloy form in the machine tool industry, in manufacture of certain types of pipe and in electrical applications.

Because of its phosphorescent property it is used in combination with zinc, manganese and silica for inside coating of fluorescent lighting units.

EFFECT ON THE SKIN

Wider use of beryllium stimulated study on this continent with a view to confirming European findings regarding toxicity of beryllium and its compounds. In 1943, Hyslop and coworkers (6) reported on patch tests of beryllium oxyfluoride, beryllium sulphate and beryllium oxide, the compounds occurring in the North American refining processes at that time. They found positive reaction to beryllium sulphate and the oxychloride, noting that irritant action corresponded to that produced by the free mineral acids into which the two salts were hydrolyzable.

The first North American clinical report on dermatology of beryllium workers was published in 1945 by Van Ordstrand and coworkers (7). They confirmed the original European observations that dermatological manifestations consist in contact dermatitis and skin ulcer. Forty-two patients from three plants were studied over the preceding four years, most having had contact with beryllium sulphate, fluoride and oxyfluoride.

Deposition of a crystal of beryllium compound within the skin layers was found to be the causative agent in the skin ulcers, this condition being seen predominantly among beryllium sulphate workers. For healing, the embedded crystal had to be eliminated. Pathological examination of one typical case, that of a furnace operator, resulted in a diagnosis of "subacute necrotizing ulceration and inflammation of the skin of the back of the hand".

Since the end of the war, skin reactions in cases with past exposure to beryllium phosphor have been

reported. Hardy and Tabershaw (8) encountered skin lesions in two of seventeen patients under clinical study for pulmonary disease of suspected beryllium origin. Histological examination of one case was carried out and the microscopic picture was described as "characteristic of sarcoid". A year later, Pyre and Oatway (9) in a paper entitled "Beryllium Granulomatosis" reported on a pulmonary case with skin lesions showing "typical granuloma" on biopsy. These patients had been in contact with beryllium phosphor for many months before skin lesions were noted and the lesions appeared concurrently with pulmonary symptoms. In 1948, Grier and coworkers (10) confirmed these findings in a report on two cases. They regarded the lesions as of spontaneous origin and associated with a generalized disease since exposure to the phosphor had been from six months to five and one-half years before onset of symptoms.

Grier and coworkers (10) also described skin findings in three cases of cuts from fluorescent lamps. Subcutaneous granuloma was found to have developed and histology was similar to that found in the three delayed cases. Spectroscopic analysis of tissue in one case showed the presence of beryllium in significant amount. Subsequently, last October, Shook and Powell (11) published an account of a further case of subcutaneous granuloma from a beryllium phosphor exposure.

THE PULMONARY ASPECT

During the early years of the war, accounts of lung changes associated with exposure to beryllium compounds appeared in the European literature (12, 13, 14,). In 1943 Van Ordstrand and coworkers (15) of the Cleveland Clinic described three cases of chemical pneumonia in workers extracting beryllium oxide, the first reported on in North America. Concurrently, Hyslop's group (6) were investigating the problem on the laboratory level. After a lengthy series of animal experiments they concluded that beryllium of itself was not toxic.

Fig. 1—VanOrdstrand's Case 5—(a) diffuse atypical nodular infiltration approximately 24 days after onset of illness (appearance resembles pneumonoconiosis); (b) complete clearing of nodular infiltration nine weeks after onset of pneumonitis. (See footnote)

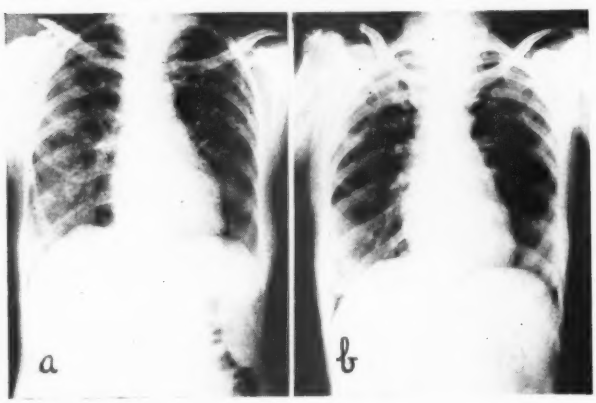


Fig. 1

The following year, Kress and Crispell (16) reported on four cases of chemical pneumonitis in men working with fluorescent powders (beryllium carbonate and beryllium manganese silicate), thus extending the range of compounds associated with pulmonary ill-effects.

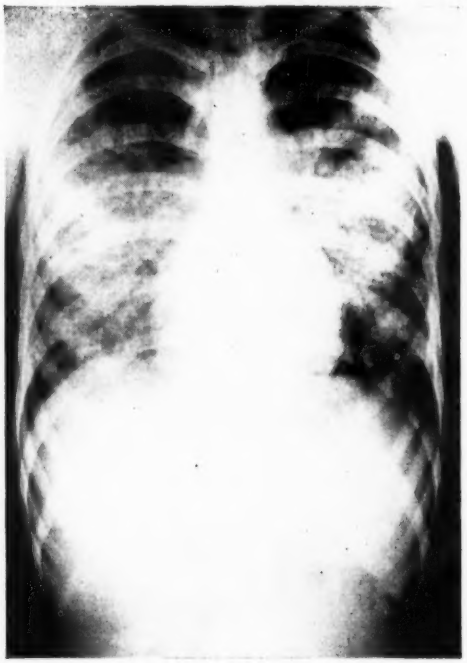


Fig. 2

Fig. 2—Van Ordstrand's Case 7—Diffuse pneumonitis three weeks after onset of illness. Death occurred on forty-fourth day of illness. (See footnote)

In 1945 Van Ordstrand and coworkers (7) pubished a second report covering clinic experience with 128 patients from ore-refining operations. One group of 90 were seen with chemical nasopharyngitis and tracheobronchitis associated in some instances. Thirty-eight cases of pneumonitis comparable to those described by Gelman (5) were encountered among workers at many different stations in the processes. Roentgenological changes were carefully noted and served to formalize a clinical picture of acute beryllium-associated chemical pneumonitis.

These appeared at about second or third week after onset of symptoms and physical signs. In order, the following were observed: (1) diffuse haziness (2) development of soft irregular areas of infiltration with prominence of peribronchial markings (3) absorption of soft infiltration and appearance of discrete large or small conglomerate nodules scattered throughout both lung fields (4) clearing of the lung fields after one to four months. Figure 1 reproduced from Van Ordstrand's paper shows roentgenograms of case 5, a woman who had worked adjacent to a beryllium fluoride furnace. Though appearance resembled pneumoconiosis, shadows disappeared. Fig. 2 exemplies diffuse pneumonitis in the case of an eighteen-year-old boy who had worked in a beryllium copper department for forty days. Case history states "was admitted to the hospital May 19, 1943, four days after stopping

Footnote: Figures 1 and 2 reproduced with kind permission of Journal of the American Medical Association.

work because of cough, shortness of breath and substernal burning pain. Symptoms were of one week's duration and were progressive. After admission severe dyspnea and cyanosis developed and respirations became rapid and shallow. Oxygen and supportive therapy were not effective and the patient died on the forty-fourth day of his illness."

Histories of five fatal cases and two of recovery were presented by Van Ordstrand to stress the importance of complete bedrest, possibility of recurrence on return to exposure and desirability of change of job for recovered workers. Though in three fatal cases Van Ordstrand and coworkers had analyses of lung tissue conducted for beryllium, and significant quantities were found, it would appear that their work, even when taken in conjunction with that of Kress and Crispell, as well as previous investigators, does not specifically incriminate beryllium.

DISCOVERY OF A DELAYED REACTION

In 1946 Hardy and Tabershaw (8) reported the existence of "delayed chemical pneumonitis" among twelve persons who had worked with beryllium phosphor (zinc manganese beryllium silicate) in a particular building of a North American concern. The patients developed disease in from three months to three years after leaving their jobs. Four other cases among persons on the job also occurred.

Weight loss, dyspnea and cough were found to be the most important complaints at onset. During acute illness dyspnea was severe. Abnormal auscultatory signs were frequent. Roentgenological findings, combined with weight loss, led to initial diagnosis of miliary tuberculosis in most cases. As study continued and attempts to culture tubercle bacilli failed, diagnosis of Boeck's sarcoid was entertained. Subsequently job histories and further roentgenological findings were combined with the mortality rate (35%) as providing a basis for ruling out Boeck's sarcoid. Roentgenology and pathology ruled out silicosis and established a diagnosis of delayed chemical pneumonitis. X-ray picture, delineated by Sosman and Wilson, was similar to that described by Van Ordstrand for acute chemical pneumonitis but showed an initial variation from normal in the form of "a fine diffuse granularity", this being followed by reticular and granulomatous changes. (These findings were in general reaffirmed by Pascucci (17) in an exhaustive study of chest plates of 32 cases including some of the Hardy and Tabershaw series. Figure 3, reproduced from his paper, exemplifies the granularity characteristic in a case of the delayed disease associated with beryllium phosphor powder exposure). Hardy and Tabershaw regarded intense dyspnea, progression of signs and symptoms even with change of environment, illness of long duration and grave prognosis as differential points in comparison with Van Ordstrand's acute cases. Subsequently, Pascucci (17) noted that differentiation between acute and delayed forms was possible only on serial roentgenogram comparison.

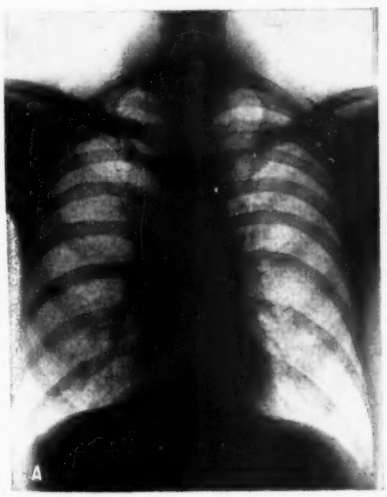


Fig. 3—Pascucci's Case 3 —June 25, 1946, Generalized diffuse granular infiltration having a reticular pattern. Vascular markings in upper lung fields obliterated. Lungs were reported normal July 18, 1943. (See footnote)

NEIGHBOR CASES

Clinical syndrome of delayed chemical pneumonitis was observed by Hardy (18) in two persons who had lived close to a factory where fluorescent powder was used. Both cases had fatal issue. A third case reported in the same paper was that of a mother of a worker who had died after a two-year course of the delayed disease. Hardy stressed the significance of these cases from the general public health aspect.

Histopathology of the fatal cases and four worker cases added little to previous knowledge but according to Hardy, pathologists were agreed that the picture was one of an unusual type of severe granulomatous reaction which replaces normal tissue and chiefly involves the lung, but is also present in the hilar nodes and liver. A subsequent worker case described by Agate (19), that of a physicist who had handled beryllium fluorescent powder, revealed the occurrence of granulomatous lesions in the liver as well as the lungs.

ENVIRONMENTAL ETIOLOGY

Two recent reports serve to strengthen the role of beryllium in etiology of acute chemical pneumonitis. The Lancet (20) quotes Policard on animal dusting experiments with beryllium sodium fluoride in which violent pulmonary oedema with fatal issue was produced. Eisenbud and coworkers (21) quote Aub and Grier on acute cases which have occurred among a group employing beryllium oxide and another group working with beryllium metal in a machine shop. Policard's recent production of granulomatous lung nodules in animals by dusting with beryllium oxide would appear to give experimental confirmation to clinical observations on beryllium phosphor effects.

PREVENTION

Beryllium alloys, to the extent of 9½ tons, were imported into Canada in 1947, according to United

Footnote: Fig. 3 Reproduced with kind permission of "Radiology."

States export statistics. A number of factories are engaged in work with fluorescent powders. Thus, the problem of protecting Canada's working population exists.

All investigators stress the importance of preventive measures at site of exposure. Local exhaust ventilation of furnace emanations, welding fumes, dust and handling operations on powders is imperative. Routine medical supervision for beryllium-exposed employees is clearly of utmost importance.

BIBLIOGRAPHY

(1) Weber, H. H. and Engelhardt, W. E.
Zentralbl. f. Gewerbehyg. 10: 41, 1933.

(2) Magnitzky, A. N., Zamakhovskaya, E. M., Losovsky, I. M.' Vyropaev, D. N., Chilova, A. P., Israilskaya, N. M., Marzinkowsky, Gelman, Pack, Kaplan.
"Occupational Poisoning by Oxyfluoride of Beryllium." Vol. XXXIV of Transactions of the Obouch Institute of Occupational Diseases. Moscow, 1935-36.

(3) Gelman, I.
J. Ind. Hyg. and Toxicol. 18: 371, 1936.

(4) Fabroni, S. M.
Patologia polmonare da polveri di berillio.
Med. d. Lavoro 26: 297, 1935.

(5) Gelman, I.
Occupation and Health Supplement, International Labor Office, 1938.

(6) Hyslop, F., Palmes, E. D., Alford, W. C., Monaco, A. Ralph, Fairhall, L. T.
National Institute of Health Bulletin No. 181, U.S. Public Health Service, 1943.

(7) Van Ordstrand, H. S., Hughes, R., DeNardi, J. M., Carmody, M. G.
J.A.M.A. 129: 1084, 1945.

(8) Hardy, H. L., and Tabershaw, I. R.
J. Ind. Hyg. and Toxicol. 20: 197, 1946.

(9) Pyre, J. and Oatway, W. H., Jr.
Arizona Med., 4:21, 1947.

(10) Grier, R. S., Nash, P., and Freiman, D. G.
J. Ind. Hyg. & Toxicol. 30: 228, 1948.

(11) Shook, C. F., and Powell, J. P.
Ind. Med. 17: 403, 1948.

(12) Berkovits, M., and Israel, B.
Klin, Med. 18: 117, 1940.

(13) Meyer, H. E., Beitr., Z.
Klin. b. Tuberk, 98: 388, 1942.

(14) Wurm, H., and Ruger, H.
Beitr. Z. Klin. d. Tuberk, 98: 396, 1942.

(15) Van Ordstrand, H. S., Hughes, R. and Carmody, M. G.
Cleveland, Clin. Quart. 10:10, 1943.

(16) Kress, J. E. and Crispell, K. K.
Guthrie, Clin. Bull, 13:91, 1944.

(17) Pascucci, L. M., Radiology, 50:23, 1948.

(18) Hardy, H. L.
Am. Rev. Tuberc. 57: 547, 1948.

(19) Agate, J. N.
Lancet 255: 530, 1948.

(20) Lancet, 255: 536, 1948.

(21) Eisenbud, M., Berhout, C. F., and Steadman, L. T.
J. Ind. Hyg. & Tox. 30: 281, 1948.

Health Education in Industry

Most of the illness causing absenteeism is not due to any special industrial hazard or accident. It is due, in significant measure, to poor health habits, unsatisfactory environmental conditions or to the spread of some communicable disease. Moreover, for every illness causing absence from work there are many sub-clinical cases in which the employee's vitality, efficiency and happiness is reduced. The average worker loses about 10 days each year from sickness and it is probably true that many do not reach and maintain their optimum level of health.

A factor which contributes to the existence of sub-optimal health levels among industrial workers is the absence on the part of the employee of a positive attitude towards personal health which can alter undesirable habits and create new and healthful ones. Yet the experience of health agencies and insurance companies has established the fact that the industrial worker is receptive to health information and will change poor health practices to conform to his new knowledge. It is well worth the effort of industrial management and employee organizations to promote this important aspect of industrial health services by providing facilities for imparting health information to the working population.

There are many ways to conduct health education in industry, beginning with the simple distribution of health literature and developing towards more ambitious projects involving employee participation. Many pamphlets and posters are available which can be used to inaugurate a health education program. The provincial departments of health and the larger insurance companies are valuable sources for such material. Among the available informational aids are the industrial posters illustrated here. They are prepared by the Industrial Health Division of the Department of National Health and Welfare and can be obtained in quantity from provincial health departments. When

prominently displayed in the plant and supplemented by the provision of health pamphlets to members of the staff these posters may serve to stimulate interest in personal health practices.

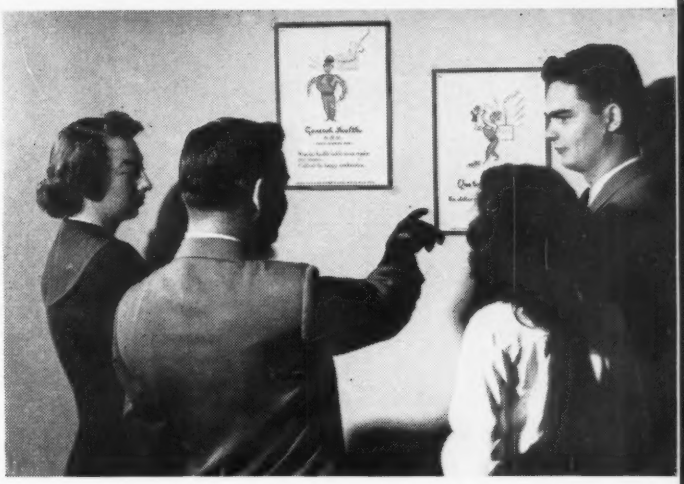
The Industrial Health Division also issues a monthly ***Industrial Health Bulletin*** which serves to inform management and labor of the manifold and developing practices of industrial health. When an article in the ***Bulletin*** is thought to warrant a plant-wide audience it can be reproduced in the plant publication or mimeographed for general plant distribution.

In these endeavors, it should be borne in mind that employee participation is an important part of the educational process and should be encouraged at every opportunity. As employees begin to take part in planning the program, in deciding on the health topics to be discussed and in choosing the methods and media to be used, their role changes from passive recipients of health information to active participants in improved health practices.

An example of successful employee participation is found in accident prevention work. In many industries, safety committees composed of management and employee representatives are responsible for the promotion and practice of plant safety. On the basis of joint labor-management cooperation, a continual effort is made to teach safe working procedures to workers by enlisting their active support in the general safety program. In the same way the promotion of health is an objective of common concern in which the same methods of joint initiative and action can be used that now obtain in accident prevention.

A program for health education can usually be carried out by a committee consisting of interested key personnel among the staff and management. Their first task is to choose a few health subjects which are found to be of particular interest to employees. These subjects, which may refer to personal health habits, particular diseases, or the health services of the community, should be dealt with in the early phases of the program by means of talks given by physicians, public health nurses or other suitably qualified persons. This method has proved most effective in getting across vital health information and in stimulating employees to take a more active interest in health matters.

There are many services and materials that can be used in the plant program. Health pamphlets on a large variety of subjects are available from voluntary health agencies, insurance companies and municipal, provincial and federal health departments. These can usually be obtained free of charge or at cost. For maximum effect it is advisable to distribute a pamphlet when it is related to the subject of some discussion or action being currently undertaken in the plant. However, employees should be aware of the subjects covered by other health pamphlets and that they are available on request.



Over 200 health films are assembled in the health library of the National Film Board and can be obtained at a nominal charge through the regional office of the Board located in the capital city of each province (the Quebec office is in Montreal). A catalogue describing each of these films may be obtained from the Health and Medical Films Section, Distribution Branch, National Film Board. It will be found that films are available on almost every subject in a health education program. The previous issue of the ***Industrial Health Review*** lists the films on industrial health that may be obtained from the National Film Board. In its ability to present information in a realistic and acceptable manner, the film is one of the most powerful of all educational aids.

In expanding its program, the health education committee should be aware of facilities offered by community agencies in the health and recreation fields. Participation of employees as citizens in the wider effort to improve community health is "grass-roots" education in health.

The presence of a plant medical service creates additional educational opportunities of importance. Together with other members of the professional staff, the industrial nurse is in a strategic position to stimulate the health education program. Through her association with management and the staff, she can gain their support in a program to improve personal and plant health practices which can gradually influence the home and community. In extending her services beyond the care of accidents and illness towards an emphasis on the methods of achieving positive health she can accomplish much in preventing and alleviating illness. Individual health counselling and the promotion of a wider program of health education are rich opportunities available to the staff of a plant medical service.

Whether management, the plant nurse or the personnel officer initiates a health education program it should be remembered that employee participation is the goal to be kept in view. A program which makes full use of the many educational aids that are available cannot fail to develop the initiative of the worker in caring for his own health.

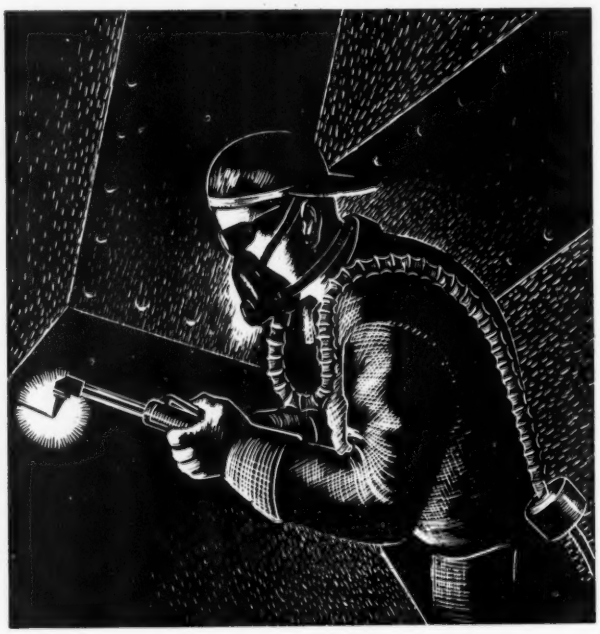
Lead Hazards
AT SCRAP BURNING OPERATIONS

By C. R. ROSS, Acting Director
Division of Industrial Hygiene
Nova Scotia Department of Public Health

Steel scrap, as received at the steel mill, includes such items as railway cars, ships, automobiles, and castings. Much of this material is unpainted or has lost whatever paint it might have had and consequently little hazard is involved in burning it. Some material, however, is metal coated or painted or both, and the coatings or paints may contain lead, zinc or other toxic materials. At times the steel has electric cables, piping or insulation attached to it, and burning such steel gives rise to irritant and possibly toxic gases in addition to metal fumes.

We have recently had occasion to study scrap burning operations with a view to measuring lead exposure and recommending means for the control of fumes. We have observed scrap burners at work on ships which were being dismantled in an outdoor scrap yard and in a large building. In general, the burning process consists of cutting large structures, such as ships, into sections which can be conveniently handled and then cutting the sections into pieces suitable for charging to open hearth furnaces.

Our study has included air sampling for lead at the various work places and periodic urine analysis for lead. Exposure of burners to lead as measured by air analysis was found to vary over wide limits—at times being practically nil and at times reaching very high concentrations. In view of the varied nature of the metal being cut this was to be expected. Some 400 urine samples have been analyzed so far, and results indicate the workmen have a significant lead exposure. Control of the fumes is difficult. Burning takes place far more rapidly than welding and control of the fumes by flexible exhaust hose such as is sometimes used at welding operations is not practical.



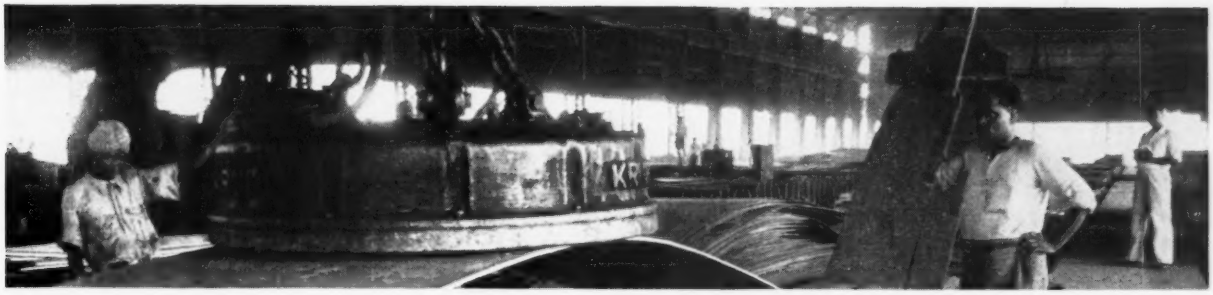
Because of the large irregular shape of the sections cut exhaust hoods would be prohibitively expensive. Dilution of the fumes by directing streams of fresh air at the burners has been tried and this method effects a marked reduction in lead concentration but cannot be relied upon to keep exposure to lead within safe limits. Approved types of filter respirators were supplied the workmen but most of the men refused to wear them and complained of the collection of moisture inside the face pieces, interference with wearing goggles, aggravation of sinus conditions and penetration of the masks by choking gases while cutting electrical cable. Workmen are now trying out various types of supplied air respirators and helmets.

INDUSTRIAL PHYSICIANS TO MEET IN QUEBEC

A meeting of the Industrial Medical Association of the Province of Quebec is planned for September 22nd to 24th. It will be held in Quebec City and the Association invites industrial physicians in Quebec and other provinces to attend. The program will include a series of lectures on several aspects of industrial medical practice to be given at the Chateau Frontenac as well as clinical sessions at the various hospitals. Those attending will have a valuable opportunity for mutual exchange of experience.

§ § §

Dr. James E. Barnard, formerly Assistant Medical Officer of Health with the Porcupine Health Unit at Timmins, Ontario, joined the staff of the Division of Industrial Hygiene of the Ontario Department of Health in January 1949.



STATE AND *Industrial Health* IN INDIA

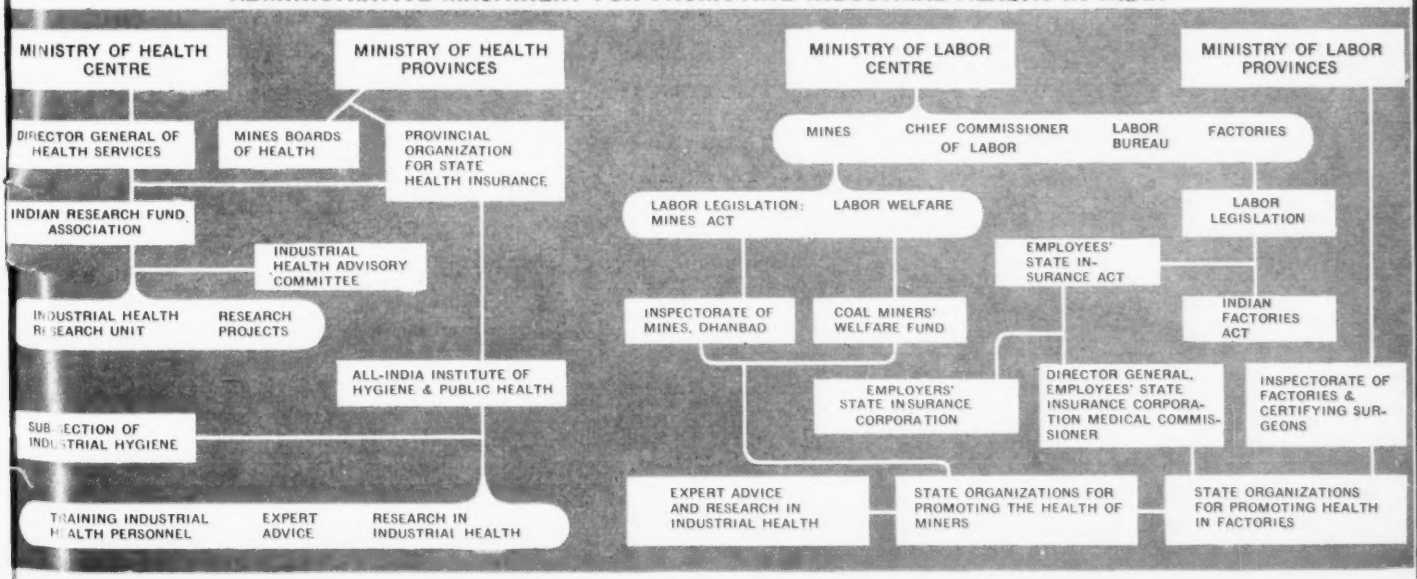
Labor legislation in India has been in existence for more than a century. The Bengal Regulation 7 of 1819 might be said to be the first legislative measure. Labor legislation to promote the health of the workers has, however, been brought into being only during the last quarter of a century. The various Acts that have been passed by the legislature during the turn of the century and early this century have been repeatedly amended so that today there is in India a fair amount of state control to maintain the health of the industrial workers.

The legal measures and administrative machinery in this country are to a certain extent modelled after the British type. India being a larger country, however, there is decentralization of responsibilities in the case of factories. The provincial autonomy of 1935 and the new constitution of India envisage greater responsibility for the provinces. It is expected that the legislation would be extended to the entire country when the question of reorganization of states is taken up.

A new step forward in social security was taken when the Employees' State Insurance Act, 1948, was placed on the statute book in April, 1948. This Act seeks to cover some of the main risks that threaten the worker's livelihood, namely sickness, personal injury by accident or diseases connected with employment and, if the worker is a woman, maternity.

The Act applies in the first instance to all employees in perennial factories getting a remuneration not exceeding Rs. 400/– per month. The cost of the

ADMINISTRATIVE MACHINERY FOR PROMOTING INDUSTRIAL HEALTH IN INDIA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FACTORIES
LABOR LEGISLATION: MINES ACT
LABOR WELFARE
LABOR LEGISLATION
EMPLOYEES' STATE INSURANCE ACT
INSPECTORATE OF MINES, DHANBAD
COAL MINERS' WELFARE FUND
INDIAN FACTORIES ACT
EMPLOYERS' STATE INSURANCE CORPORATION
DIRECTOR GENERAL, EMPLOYEES' STATE INSURANCE CORPORATION MEDICAL COMMISSIONER
INSPECTORATE OF FACTORIES & CERTIFYING SURGEONS
EXPERT ADVICE AND RESEARCH IN INDUSTRIAL HEALTH
STATE ORGANIZATIONS FOR PROMOTING THE HEALTH OF MINERS
STATE ORGANIZATIONS FOR PROMOTING HEALTH IN FACTORIES

risks covered by the scheme are to be met mainly out of the contributions payable by the employee and the employer. The Union government will meet, however, two-thirds of the cost of administration for the first five years. The provincial governments are to provide the medical care and to meet one-third of the cost thereof.

Under the Act the insured worker, when he is sick, will receive in addition to other benefits, medical care and treatment by doctors employed for this purpose at dispensaries and hospitals run by the provincial governments. A novel feature of the scheme is that the cash benefits thereunder and the contributions therefor are not at a standard rate independent of the wages of the insured persons but are dependent on their average wages. For this purpose the insured persons are divided broadly into eight wage-groups. Provision has also been made in the Act for the extension of medical benefits to the family of the insured person as and when possible.

The implementation of the Act throughout the country will take some time. So far only the portions of the Act relating to the administrative aspects have been brought into force. The Corporation which is to administer the whole scheme has also been set up. It is hoped that it will be possible to implement the scheme earlier in the centrally administered areas of Delhi and Ajmer-Merwara as a pilot scheme.

A chart on the existing machinery for promoting industrial health in India with special reference to factories and mines is given on the preceding page.

Director, All-India Institute of Hygiene
and Public Health.

U.S. Smog Disaster Studied

Teams of physicians, nurses, engineers and analysts from the Division of Industrial Hygiene, United States Public Health Service, are working in Donora, Pa., in a comprehensive study to determine the causes of the smog which took 19 lives last November.

A three-pronged preliminary investigation of all factors potentially related to the tragedy was made in December. The study was initiated at the request of and in cooperation with the Pennsylvania State Department of Health, the Borough Council of Donora and the United Steelworkers of America, CIO. The information obtained in the preliminary investigation was the basis for planning the detailed study which started in January. Data on topography and meteorological conditions, industrial and domestic activities and types and quantities of fuels used for transportation and domestic purposes are fundamental facts which must be known prior to making a study of this magnitude. A survey of the Donora industries to obtain information on materials and processes used and the size of operations was also a part of the preliminary investigation.

Engineering studies are twofold: those to determine the sources and amounts of contaminants and those to determine the dissemination of contaminants Medical studies include analyses of cases of illness as well as cases of fatalities. A house-to-house canvass of approximately 1,200 families is being made to ascertain health histories. Interviews with members of the Red Cross, the Fire Department and other groups who were actively concerned with stricken citizens are also a part of the investigation. The relation of housing conditions to the incidence of morbidity, mortality records of the community, plant records of morbidity and other factors which may contribute to the total picture are also being examined.

It is hoped that the investigation will not only reveal the elements in the smog which caused the deaths but will also furnish information that will be helpful in preventing future occurrences and at the same time contribute worthwhile data to the general field of atmospheric pollution. Because of the complexity of the problems under study the field work alone may take several months to complete.

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Edmond Cloutier, C.M.G., B.A., L.Ph.
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